

WHAT IS CLAIMED IS:

- 1 1. A method of defining a phase shifting mask, the method
2 comprising:
3 defining critical poly regions and adjoining poly, the critical
4 poly regions being regions desired to be defined by phase shifting;
5 creating phase regions on either side of the critical poly
6 regions;
7 assigning phase angles to the phase regions such that the
8 phase regions have either a first phase angle or a second phase angle;
9 defining edges of the phase regions being assigned the
10 second phase angle, the edges not defining a poly pattern;
11 defining a boundary region around the defined edges; and
12 defining regions outside a desired poly pattern, phase
13 regions, and boundary region to have the first phase angle, wherein the
14 desired poly pattern, phase regions, and boundary region define a mask.
- 1 2. The method of claim 1, further comprising enhancing the
2 phase regions assigned a phase angle.
- 1 3. The method of claim 1, wherein enhancing the phase regions
2 assigned a phase angle includes reducing the effect of transition regions
3 by moving transition regions away from the critical poly regions.
- 1 4. The method of claim 1, wherein the first phase angle and the
2 second phase angle of the phase regions are assigned phase angles 180
3 degrees from each other.
- 1 5. The method of claim 1, wherein the step of defining a
2 boundary around the defined edges includes defining a boundary around
3 edges having phase 180.

1 6. The method of claim 1, wherein the step of defining a
2 boundary around the defined edges comprises forming a chrome path.

1 7. The method of claim 1, further comprising defining break
2 locations where phase transitions are most likely to occur.

1 8. The method of claim 7, wherein the break locations have a
2 width that permits patterning and inspection.

1 9. The method of claim 1, further comprising generating a trim
2 mask to remove undesired patterns between regions of the first phase
3 angle and the second phase angle.

1 10. A method of generating phase shifting pattern to improve the
2 patterning of gates and other layers needing sub-nominal dimensions, the
3 method comprising:

4 defining critical areas;
5 creating phase areas on either side of the critical areas;
6 assigning opposite phase polarities to the phase areas on
7 each side of the critical areas;
8 enhancing phase areas with assigned phase polarities;
9 defining break regions where phase transitions are likely to
10 occur;
11 generating polygons to define other edges and excluding the
12 defined break regions;
13 merging the generated polygons with enhanced critical gate
14 areas having a common phase polarity;
15 separating the polygons having interactions with more than
16 one polarity into portions which are merged into regions having only one
17 polarity;

18 constructing a boundary region outside of phase 180
19 regions; and
20 defining undefined regions as phase 0 regions.

1 11. The method of claim 10, further comprising:
2 correcting design rule violations; and
3 applying optical proximity and process corrections to phase
4 regions to allow proper pattern generation.

1 12. The method of claim 11, further comprising generating a trim
2 mask to remove undesired patterns between phase 0 and phase 180
3 regions outside of a desired pattern.

1 13. The method of claim 12, wherein the generating is done by
2 oversizing boundary and break regions.

1 14. The method of claim 10, wherein the break regions are about
2 a minimum width of a desired poly pattern.

1 15. The method of claim 10, wherein enhancing critical areas
2 with assigned phase polarities includes adding edges to the critical areas.

1 16. A method of enhancing clear field phase shift masks with a
2 border around outside edges, the method comprising:
3 assigning phase polarities to phase regions;
4 defining edges of the assigned phase regions;
5 establishing a boundary around the added edges; and
6 assigning area outside of the established boundary to have
7 phase zero.

1 17. The method of claim 16, wherein defining edges of the
2 assigned phase regions includes defining break regions where phase
3 transitions occur and generating polygons including edges but excluding

4 break regions, wherein the polygons are merged with the assigned phase
5 regions.

1 18. The method of claim 17, further comprising curing design
2 rule violations and applying correction procedures.

1 19. The method of claim 17, further comprising generating a trim
2 mask to remove undesired patterns between phase 0 and phase 180
3 regions.

1 20. The method of claim 19, wherein the generating is done by
2 oversizing the boundary and break regions.

1 21. A integrated circuit formed by a process comprising:
2 defining phase areas including adjoining poly areas located
3 proximate to critical areas;
4 assigning a first phase angle to the phase areas;
5 defining remaining poly edges as part of the phase areas;
6 defining a boundary around the defined phase areas, the
7 areas outside the boundary being assigned a second phase angle, wherein
8 the phase areas, the boundary, and areas outside the boundary defining a
9 mask, wherein the first phase angle and the second phase angle are
10 different;

11 curing violation areas and applying correction procedures to
12 appropriate areas on the mask; and

13 patterning a structure on the integrated circuit using the
14 mask.

1 22. The integrated circuit formed by the process of claim 21,
2 wherein the second phase angle is zero.